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STERNBERG'S TRIARCHIC THEORY

Huda Bourhan Saifuddin

Sternberg's Triarchic Theory (1985) included three essential sub-theories, which were the componential, the experiential, and the contextual. These three sub-theories are various processes that affect the performing of cognitive tasks, and consist of the information processing skills that drive intelligent behavior. Sternberg (1987) defined these processes as an elementary information process that operates upon internal representation of objects or symbols. The componential sub-theory is discussed in greater depth in this section for its relevance to analogical reasoning, as it outlines the structure and the mental mechanisms underlying the reasoning. This sub-theory of information processing includes three aspects: meta-components, performance components, and knowledge-acquisition components.

Meta-components are higher-order mental processes that determine which performance and learning components will be used as well as the sequence in which they will be used. These components (Figure 2.4) are common for all tasks; they plan, monitor, and evaluate what one is doing. Furthermore, they activate performance and knowledge-acquisition components (Sternberg, 1987, Sternberg et al., 2000).

Performance Components are referred to as lower-order processes, which are basic processes involved in intellectual activities. They are often specific to the type of problems being solved and they follow the plans laid out by the meta-components. They include processes such as encoding, combination, comparison, and response. Encoding is concerned with initial perception and storage of new information, whereas combination

and comparison processes are involved in putting together or comparing information. For example, inductive reasoning tasks such as matrices and analogies involve a set of performance components, which include encoding, inference, mapping, application, comparison, justification, and response (Sternberg, 1987, Sternberg et al., 2000).

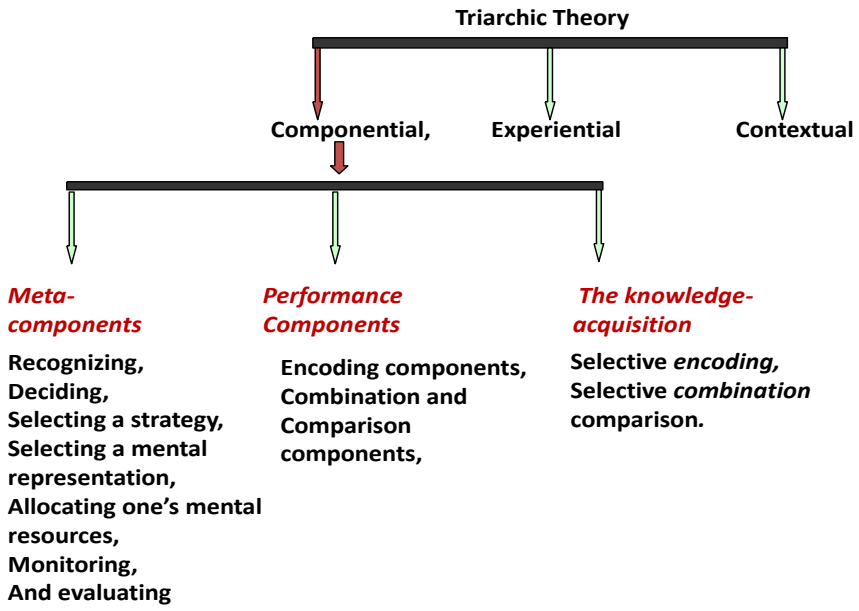

Figure 2.3: Triarchic theory (Sternberg, 1987).

The Knowledge-Acquisition Components are also lower-order of mental processes, which help discover what knowledge and information are needed to solve the problem. Sternberg and Davidson (1999) identified three types of selectivity involved in analogical reasoning: selective encoding, involving sifting relevant from irrelevant information; selective combination, involving combining information from isolated pieces into a unified

whole; and selective comparison, involving comparing relatively newly acquired information to information acquired in the past. For example, in problem solving by analogy one relies on specific similarities between new information and old information, and one uses information about the similarities to better understand the new problem. Therefore, a problem solver must focus on the general structural features of the two problems rather than only on the specific responses needed to solve the problem.

Thus, according to Sternberg (1987) and Sternberg et al. (2000), meta-components activated performance and knowledge-acquisition components, which in turn provided feedback to the meta-components (Figure 2.4).

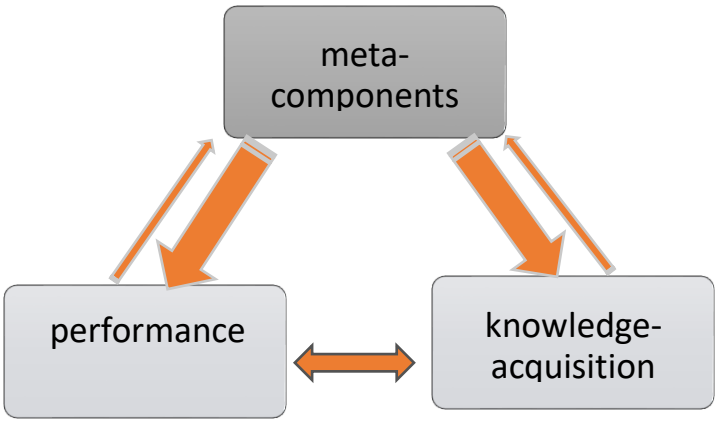

Figure 2.4: The three components of the componential sub-theory (Sternberg, 1987)

Furthermore, Sternberg (1987) identified eight different operations involved in problem solving: (a) recognizing the existence of the problem, (b) deciding on the nature of the problem, (c) selecting the lower-order processes that will be needed to solve the problem, (d) selecting a strategy to combine them, (e) selecting a mental representation on which the strategy can act, (f) allocating one's mental resources, (g) monitoring one's problem solving as it is happening, and (h) evaluating one's problem solving after it is done.

According to Sternberg (1986), analogical problem solving involves four steps. First, encode or identify the defining attributes of each term in the analogy (example A: B: as C:D). Second, infer a relationship between the first and the second terms in the analogy (A:B). Third, map the relationship between the first term and the third terms (A:C) and last, applying the relationship observed between the first and second terms (A:B) to the third and fourth terms (C:D).

In addition, Sternberg (1986) differentiated between mapping and inference, whereby the former is the recognition of a higher-order relation between two lower-order relations, and the latter is the recognition of a relation between two different elements or within a single item. He highlighted that mapping is related to inference but differs from it by illustrating that the relation between "grey" and "elephant" requires inference, while the relation between "grey-and-elephant" on the one hand and "brown-and-grizzly bear", on the other hand, requires a mapping.

Thus, Sternberg argued that mapping is essential to the solution of most kinds of analogies because analogical reasoning and problem solving require us to see the second-order relation between two lower-order relations (Sternberg & Grigorenko, 2002).

Sternberg's (1987) componential sub-theory is presented in this study as a theory of intelligence because it describes the various cognitive processes underlying problem solving. It gives a comprehensive framework for understanding how information is processed while solving problems. According to (Eysenck, 1998), the Triarchic theory bridges the gap between intelligence and research in problem solving. However, the theory essentially analyzed analogical problem solving as an index of intelligent behavior and not as a cognitive tool for learning or acquiring new knowledge, which is presented in the Structure Mapping and Multi Constraints theories of analogical reasoning discussed below.

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